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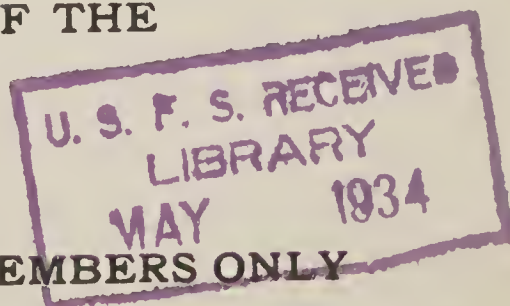
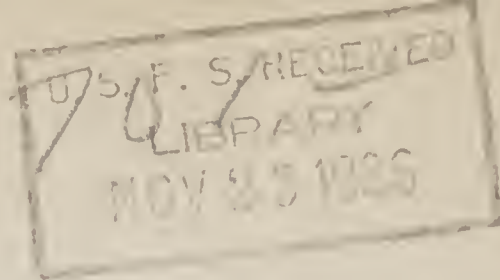
FEBRUARY 1, 1934

EXECUTIVE AND PERSONNEL
MANAGEMENT
ON THE
NATIONAL FORESTS



A MEDIUM FOR THE EXCHANGE OF IDEAS AND
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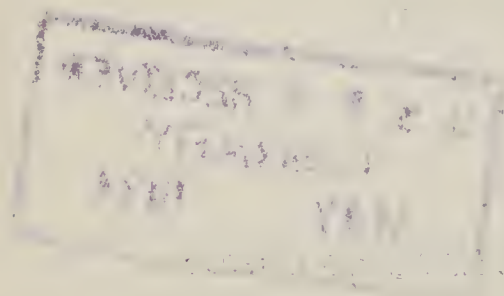


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ELK MANAGEMENT PLANS

I have selected three plans from quite a number on file here in the office. These are neither the best nor the worst, but are, I think, typical and represent the usual problems. Read them not to criticize, but to see what is being done. Keep in mind the definition of game, the definition of management, and the objectives of management that I gave you. Game includes only animals hunted for sport. The objective is to increase the number "in the bag." The method is to "manipulate" factors in the environment. The one to work on first is the "limiting factor." For each species of game there is a natural rate of increase, or possibly one might better say a maximum rate, attained only under ideal conditions. In management we try to make each factor conform to the ideal, get the greatest possible yield in numbers, and make the harvest of numbers yield the greatest possible in sport.

Read these plans with these ideas in mind. What is the yield provided for? How near does it approach the maximum? What factors account for the difference? Is the limiting factor located? What is done to manipulate or control it? Are any of the other factors manipulated and in what way? What does it cost? Do not attempt to criticize. Let us assume that the man on the ground is doing the best he can. Rather, let us view the results and see in so far as we can who is getting what out of it.—P. K.

GAME MANAGEMENT PLAN FOR WILLIAMS FORK HERD OF ELK

By DONALD E. CLARK

I. Origin, History, Past and Present Status of Herd.

This herd of elk winters on and adjacent to the Williams Fork State Game Refuge, largely on the Beaver, Muddy, and Williams Fork drainages. Its present number is conservatively estimated as 1,500 head. As far as can be determined from local sources, the original herd was not planted. In 1913, Forest officers estimated its size at 50 head. Natural increase has apparently been supplemented to a certain extent by a movement from other winter ranges, less suitable, in the Middle Park region.

In 1929, the season was opened for hunting of elk for a three-day period, November 3-5. The State Refuge was opened as well as the surrounding region. The elk were concentrated on the Refuge due to early heavy snows, and the hunters were numerous. It was estimated that 290 elk were killed on and off the Refuge. No damage whatever to the elk herd apparently resulted, but a large number of deer were also killed.

II. Importance and Place in Locality from Standpoint of:

1. PUBLIC SENTIMENT.

Local people, including the chapter of the Izaak Walton League, are very much in favor of maintaining the herd but are not averse to well-regulated hunting for a short season as long as the present size of the herd is not greatly diminished. However, they are strongly against an open season on the game refuge.

The local state game warden, well respected in this region, has recently recommended such a season at the time of the regular deer season, for all of Grand County excluding the Refuge.

2. CONFLICTING INTERESTS.

In normal winters during the past five-year period about eight cattle ranches of medium size have suffered annual damage to haystacks. No means for protecting these stacks have been used by these ranchers, except that of driving off the elk. The actual amount of consumption of and damage to the hay is not as important from the standpoint of market value of the hay at that time as the loss of the "insurance" for carrying cattle through an especially hard winter from a feeding standpoint; also the anticipated increase in damage in the future under no system of control. In a normal or light winter most of these ranchers would not begrudge the elk this hay. Local people, the Izaak Walton League Chapter, and the local State game warden recognize the just complaints which have been made by these ranchers and are particularly concerned with the elimination of such damage.

A survey of damage in the past shows that in the winter of 1928-29 there

was a loss of about fifty to sixty tons of hay, valued at \$400 to \$480; in 1929-30, thirty to forty tons valued at \$240 to \$320; in 1930-31 to February 1, twelve tons valued at \$96, with an additional damage estimated for the remainder of this winter of ten tons, valued at \$80. These figures have been arrived at in conference with the local game warden. A gradual reduction since 1928 will be noted regardless of increase of the herd. Feeding of hay to the elk was initiated in 1927-28 in small amounts and has been increased to the proposed amount of thirty tons for this winter on Beaver Creek away from the ranches damaged in the past. In addition, riding was initiated with good results, in an effort to concentrate the elk away from these ranches and herd small raiding bunches of 15 to 20 head into the main herds. During this winter shooting of some of the old bulls in bunches at the haystacks has been done under supervision of the game warden. This procedure has been successful in reducing damage to a certain extent.

No conflict is at all anticipated between the summer forage needs of the elk and the grazing of domestic livestock. In fact, there is no summer range problem for the present herd, nor would there be for a much larger herd. There is no conflict between the present herd and the summer grazing of cattle on the winter game range. The number of cattle permitted is limited to the carrying capacity of the drainage bottomlands and north slopes which because of snow are not accessible for grazing by game during the winter.

A conflict between deer and elk is not probable because of the wider distribution of deer on winter ranges in Middle Park, their greater tendency than that of elk to spread out on winter ranges, and control of numbers of deer by hunting.

3. VALUES.

The major value of the elk herd, as can be foreseen at this time, will be that to the sportsmen in hunting and the resultant returns to local business houses and resorts during the hunting season. During the open season of 1929 the number of hunters was roughly estimated at 1,000. A number varying between 500 and 1,000 may be anticipated in the future during the annual elk hunting season. The number of deer hunters during a season in which the elk are protected is estimated at only 100 to 125.

The present and probable future recreational value appears to be of little importance, as during the heavy recreational season the elk are located in the more inaccessible areas of the Forest.

The advertising values to the benefit of local communities and industries is only of minor importance. The value for distribution is rather low, due to lack of other ample winter ranges for elk in the Middle Park Region; for seed, it is not of special importance because of the abundance at other sources for that purpose.

4. PRESENT AND FUTURE FORAGE NEEDS.

Little is actually known of the natural food habits of this herd on the winter range, where the food question is most important. It is planned to make

a study along this line in connection with the annual winter field survey to be initiated next month.

It is necessary to supplement natural food with hay during severe winters in order to keep damage from winter kill at a minimum. It is advisable to feed some hay during normal winters in an effort to concentrate the elk during the heavy snow season and avert serious damage to haystacks.

The average annual need for this purpose, provided the herd is maintained at its present number, is estimated at 20 tons of hay. However, at least 30 or 40 tons should be on hand at the beginning of the season to furnish provision for a severe winter. The hay should be fed on Beaver Creek inside the Forest and the game refuge, which area is located away from the larger ranching centers. This practice is already in effect. The annual costs to the State for this supplemental feeding, based upon past experience, would be as follows:

20 Tons Hay delivered in shed @ \$16.....	\$320.00
Labor and Team Hire, feeding.....	50.00
Hay Shed \$300, depreciated over 30-year period.....	10.00
	<hr/>
Total Cost.....	\$370.00

III. Control Plan.

1. GRAPHIC MAP ATTACHED SHOWING:
 - (a) Location and extent of summer range.
 - (b) Location and extent of winter range.
 - (c) Movement of herd between summer and winter range.
 - (d) Local settlements, resorts, and ranches affected favorably or adversely.
 - (e) Area proposed for annual regulated open season.
 - (f) Check stations to be manned during hunting season.

This map shows the winter and summer range of several other herds very small in size for which protection against hunting is proposed, and which should not present a management problem for some time to come. The open season features are discussed below.

2. PRESENT SIZE OF HERD.

The present size of the elk herd is estimated at 1,500 head, based upon observations of local Forest Officers and confirmed by the local state game warden. A winter survey and count will be made in March this year and annually in the future in order to supplement general observation with a definite study.

3. OPTIMUM SIZE OF HERD.

It is agreed between local state officials, the Izaak Walton League chapter, and local Forest officers that the optimum size has been reached at the present time, and that some means should be provided to eliminate the natural increase from its present winter range.

4. NATURAL INCREASE.

The natural increase is estimated at 275 head, or about 18 per cent.

5. NUMBER AND CLASS WHICH SHOULD BE REMOVED.

The number which should be removed is estimated at 275 head, preferably the older animals, particularly the old bulls.

6. SUGGESTED MEANS OF CONTROL.

(a) *Hunting.*

It is suggested that an annual hunting season on elk be opened for the same period as that of the deer season, in that portion of Grand County which lies south of the Victory Highway and east of the Dillon-Kremmling Road, exclusive of the area in the Williams Fork Game Refuge; see attached map.

(b) *Licenses.*

A special license be issued by the State for \$10, covering both an elk and a deer, in addition to the present deer licenses.

(c) *Regulation.*

That five check stations be manned for 24 hours or the greater portion of each day for a five-day period at the time of the hunting season; each station to be manned by two deputy wardens (each at different periods of the day) who will check all cars traveling in each direction for car licenses, game licenses and game, and maintain a record of this data; see attached map.

That the area opened to hunting be patrolled by deputy wardens in co-operation with local forest officers in those regions where hunting will be concentrated.

(d) *Feeding.*

That the present system of feeding be continued.

(e) *Property Damage.*

That wherever necessary haystacks be protected with slab cribs, the State to stand that expense of construction which is in excess of an amount now expended by the rancher for ordinary pole fences.

That protection of other stacks be provided for by the present system of riding in an attempt to eliminate such damage.

That the present system of killing off old bulls around haystacks be continued as long as is warranted.

7. FINANCIAL ASPECTS OF SUGGESTED MEANS OF CONTROL.

The above mentioned riding has been and may be expected to be secured through co-operation of the ranchers with the game warden. The cost of the average size crib needed is estimated at \$50.00; the ordinary pole fence at \$15.00; the cost to the State at \$35.00; the average length of life of the crib at five years; the average annual cost per crib to the State at \$7.00. The annual number of elk and deer hunters which may be expected in this region is very

conservatively estimated at 500. The checkers and patrolmen would secure an accurate check on deer as well as elk.

ANNUAL COST OF PRESENT SYSTEM TO STATE.

3 Deputies, for a 5-day period @ \$5.00 per day.....	\$ 75.00
20 tons hay, delivered, stored* and fed.....	370.00
Total	\$ 445.00

*Hay shed now temporarily secured through co-operation.

ANNUAL COST OF PROPOSED SYSTEM TO STATE.

18 Deputies (checkers and patrolmen) for a 5-day period @ \$5.00 per day.....	\$ 450.00
20 Tons Hay delivered, stored and fed.....	370.00
12 Cribs @ \$7.00	84.00
	\$ 904.00

Cost of Proposed System to State.....	\$ 904.00
Cost of Present System to State.....	445.00

Additional Annual Cost.....	\$ 459.00
Annual returns from additional license fees under proposed system, 500 licenses @ \$5.00.....	\$2,500.00
Additional Annual Cost	459.00
Favorable Balance	\$2,041.00

This balance would furnish a fund through which unavoidable claims may be paid and to maintain small herds of elk where hunting is not permitted.



RIO GRANDE ELK MANAGEMENT PLAN

By R. E. CLARK

I. Origin and History of the Herd.

The local elk herds have undergone some remarkable changes during the past forty years. Rather extensive inquiry has disclosed that the original herds were both plentiful as to numbers and widespread as to ranges; they occupied practically all parts of the Forest with, of course, given localities representing their favorite haunts. Such conditions prevailed during the "80's" and previously.

An intermediate period, from about 1890 to 1910 or thereabouts, witnessed a rapid decline in numbers and a marked restriction in the territory within which they ranged. The herds had dwindled down to a hundred head or less and ranged almost entirely within the Goose Creek watershed. The following quotation from the Cumulative Fish and Game Report describes the situation at about its lowest ebb:

"In 1907 — Forest Rangers estimated that there were nearly 100 (elk) remaining in the San Juan Mountains. These are much scattered, and are usually encountered singly or in twos or threes. One of the largest bands, consisting of about a dozen individuals, range near the summit of the San Juans south of Wagon Wheel Gap."

The major cause of this rapid decline is placed universally upon the practice of "hunting for the market" and the usually corresponding abuses attendant therewith. In other words, the almost complete extinction of the local herds was the result of wholesale slaughter coming from unrestricted hunting. No evidence can be found where losses resulted from disease or other natural causes. Similarly, little if any blame can be placed upon the so-called encroachment of domestic stock upon the natural elk ranges. The use of the ranges by domestic stock at that time was decidedly less than it has been during the recovery period which is outlined below.

Subsequent to 1910, or thereabout, and up to the present time, there has been a gradual increase in numbers and a marked tendency to spread out over their former ranges. Forest estimates in 1914 showed 275 head. In 1930, the estimate is 823 head. It is of course difficult to say just how many head are on the Forest, but the figures are at least indicative that the local herds are increasing fairly rapidly. The point has been reached where the nucleus is of sufficient size to result in the annual increase being represented by appreciable numbers, surely greatly in excess of natural losses. The widening out of distribution has occurred almost entirely during the last decade. Personal knowledge permits the statement that ten years ago the herds confined their range to the headwaters of Goose Creek and the west side of the South Fork for summer, and to Elk Creek and the bottoms of the Rio Grande, between Wagon Wheel Gap and South Fork, during the winter. There has been an appreciable split-up of the main herd since about 1925; until now they are found to summer within all the major watersheds, from the head of the Rio Grande on down to and including the Conajos. The winter range is no longer confined; it represents the lower reaches of the Creede, South Fork, and Alder Districts, with the heaviest concentration north of the Rio Grande, between Creede and the Valley.

From the above it is evident that continued protection, through a closed hunting season, has brought about a very satisfactory reclamation of this species. It is also evident that practically full utilization of ranges suitable to domestic stock, and by such stock has in no way interfered with this increase of elk, nor is there any reason to believe that a further increase of the elk will be precluded by the use of the Forest by domestic stock in such numbers as now prevail.

II. Importance of Elk in This Locality.

Favorable public sentiment toward the protection of elk has undoubtedly played an important part in the increase of this species. Although unorganized at the time, it was public interest in the protection and upbuilding of the local herd that resulted in the Forest Service closing to use by domestic stock some

23,000 acres in 1915 to react in the nature of protected winter and summer ranges for the elk. A healthy interest has always prevailed locally in the matter of the protection and propagation of all forms of wild life. In fact, to further such causes, there has existed for some time two active organizations—the Three Rivers Fish and Game Protective Association and the Creede Chapter of the Izaak Walton League. Personal knowledge of their purposes and activities discloses that they have earnestly adopted the principle that wild life of all forms should be considered as a valuable asset to any community and must be fostered and furthered accordingly.

The attitude of these associations toward the proposal to have a statewide or even regional open season on elk has been determined recently. The Three Rivers Association was flatly opposed to such action on the basis that the present local herds do not constitute a menace to the farmers in this section, nor has the species become so numerous that a thinning-out process is justified. Members of the Creede Chapter of the Izaak Walton League were divided on the question. Some favored a statewide open season with no increase in the license fee, while others were bitterly opposed to any open season. No vote was taken, but it is the opinion that, officially, the Chapter would line up with the Three Rivers people—against the open season.

There are no known factors, incidental to the continued maintenance and material increase of the local herds, which would contribute destructively or adversely to local interests of any kind. Eight to ten years ago, when the herds were concentrated during the winter period, there was some damage to haystacks upon the Ark Creek ranch of Frank Soller. With the subsequent dissemination of the herd, however, and better fencing against them, this damage has been reduced to practically nothing. Experience has shown that the use of simple stack fences, as employed against domestic stock, will not suffice; higher, stronger, and more compact fencing is needed and found to be adequate against elk. In other words, the loss of haystacks has no room in the argument against elk; simple, practicable and inexpensive measures may be taken to eliminate such losses.

Thus far the local elk herds have figured but little in the recreational picture. Lack of numbers and their inherent tendency to locate in the remote country has precluded a ready chance for their observance by the general public. The increase of pack trips by the tourist trade, however, together with greater dissemination of the herds, will undoubtedly result in the elk coming to be recognized as a recreational value. It is believed, however, that too much emphasis should not be placed on this point, since there is danger of the entire situation entering the field of sentimentality, with obvious results.

The value of the local herds from the utilitarian viewpoint, either at this time or in the future, is difficult of analysis. There are too many interlocking factors involved. Theoretically, at least, it may be assumed that the elk is capable of management on a basis somewhat similar to a beef herd, wherein annually a given number of the adult animals, based upon a careful selection of the individuals and a fixed percentage between sexes, should be removed

for the good of the herd. This would require an accurate knowledge of total numbers, condition of the individuals, distribution as to sex, and the kind and number of increase. Possibly this could be done, but when, I am unable to predict. It would also necessitate "kills" on some basis other than the open season, wherein anyone with the price of a license is permitted to "draw a bead." I do not think that the mere increase in the herds with subsequent open seasons and heavy returns from license fees should be considered as possible utilitarian values. Such practice would undoubtedly swell the receipts for a time, but unless the question of "kills" is handled scientifically and on a correspondingly sustained basis, there is little chance to classify the otherwise temporary condition as utilitarian. It is therefore my conclusion that there does not exist an opportunity to develop the local elk herds and subsequently to manage them on a basis that will net a material financial return and thus secure for such an undertaking due recognition among the local industries. Scientific management represents the material from which such results may be produced, but the contributing details in connection therewith are beyond my limited knowledge of the subject.

As to the food habits of the elk, little is known except in a very general way. The following is quoted, however, for what value it may be:

"Mr. Caton (unknown as to his authority) says: 'As to food, the elk is not particular. All the grasses and most of the weeds within his reach are taken freely and the leaves and twigs of all deciduous trees are alike enjoyed. A considerable portion of his daily food he desires to be arboreous, yet, if deprived of it, he will keep in good condition on herbaceous food alone. In winter he will take the coarsest food and will eat freely, even that which the ox and horse reject. Elk feed leisurely during the morning and afternoon, usually resting at midday, and unlike most deer, are not active at night'."

In addition to the above, experience has also shown that elk are not necessarily extremely fastidious in their eating habits, and accordingly the scope of country included within their local ranges should afford a wide variety of palatable foods.

Actual conditions, with emphasis on the marked increase in the local herds, make it apparent that there is no necessity for supplementing the natural supply of food. It is also predicted that such necessity would not exist should numbers be increased twice what they are now and the herds continue to hold to small bunches as they have thus far.

III. Control Plan.

The accompanying map shows the areas used at present for summer and winter ranges.

Migration from winter to summer ranges is not dependent upon the disappearance of snow. It starts long before the snow is out of the high country. The herds follow the ridge tops and, like horses, frequently occupy their summer ranges when grass feed is reached only by pawing in a foot or more of snow. A return to winter ranges is made under somewhat similar conditions,

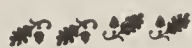
only when deep snow has accumulated to a considerable depth on the summer range.

The estimated size of the present herd is 823 head. Some confusion exists between districts in the process of estimating, but it is believed these figures are reasonably correct.

Data on increases is unknown. Assuming it be around 20 per cent and the death loss 10 per cent, the net increase would be about 10 per cent. On this basis the herd should be doubled in the next eight to ten years. This does not seem unreasonable in view of the fact that they present a very healthy condition and the herds are becoming widely distributed into individual units. The records also show 450 head in 1920, which, with 823 in 1930, bears out the above estimate.

Personally, I believe the optimum herd should be limited to about 2,000 head. On the above basis of increases, such optimum would be reached about 1940 or thereabout. If this figure was adopted and the net increase was around 10 per cent a year, then it seems logical that the plan of management would permit a removal of about 200 head each year. These removals should of course be limited to adult animals and, based upon the polygamous characteristics of the species, should probably be carried out on the basis of five bulls to one cow. This would be at the indicated rate of about 35 cows and 165 bulls a year. As indicated above, such "kills" could not be accomplished through a season open to everybody with resulting promiscuous shooting. It demands scientific management wherein the "kills" would be on a selective basis. Just how this could be brought about requires more knowledge and details than are available at this time.

Property damages, primarily the loss of hay, has never been a serious factor in this locality and it is extremely doubtful if it ever would amount to such. Experience in the matter of combating this situation is too limited to permit conclusions and recommendations, and knowledge thereof will have to come from those localities where it represents an annual problem.



ELK MANAGEMENT PLAN CABINET HERD—UNIT No. 2

By W. M. RUSH

Origin and History.

The record of grazing for 1913 shows that at that time there were 108 elk on the Cabinet Forest. The 1916 grazing report states that in 1914 about 60 head of elk were planted near Thompson Falls and that this plant had increased to 90 in 1916. From statements, found in the files, by Mr. Fitting and Ranger Adams it seems that the elk plant had actually been made in 1912 and that 38 elk constituted the plant. It is my belief that this latter statement is correct. The 1916 grazing report evidently refers to elk on the head of Vermilion River. It seems quite likely that there has always been a few native elk

on the Cabinet Forest and that the present herd is the progeny of the native elk, together with those shipped in from Yellowstone Park. The range of these elk has expanded until they occupy more or less the entire area as shown on the map.

Public Sentiment.

Through the action of the local sportsmen the elk plant of 1912 was made. The local Rod and Gun Club has taken a good deal of interest in the elk, and this report has been discussed with a number of the members and their viewpoints obtained and incorporated in this report. Ranches in the Clark Fork Valley east of Thompson Falls have been damaged to some extent by the elk, which trample down meadows in the spring, reduce the hay crop and consume forage needed by domestic stock. An appreciable increase in the elk herd will no doubt increase this damage.

Elk unquestionably have a high local value from an aesthetic standpoint. From a recreational standpoint they are valuable in that they furnish a great deal of recreation in the form of hunting. Some value as food may be given weight, since the meat of an elk is equally valuable with the same amount of beef or other meat. Unquestionably, after considering the fact that the larger part of the range used by the elk has never been successfully used by stock, it would seem that the elk as a whole are a real asset to the community, provided the damage done by them does not offset such value.

There have been three short special open seasons for hunting in the past, but at the present time there is no open season.

Forage.

There is ample summer range for many times the present number of elk, this range being principally located in the alpine types. The National Forest winter range is confined almost wholly to south exposures where conditions permit the use of browse feed. Much of the present National Forest winter range must be considered as a transitory type. This is brush range resulting from the 1910 burns on which the timbered type of forage is being steadily reduced by conifer reproduction. The range that can be utilized in winter is also the spring and fall range, and is used as well to a considerable extent in the summer.

Topography and Climate As It Affects Management.

The higher elevations are snow-covered in the winter, which forces the elk down to the lower valleys. There are practically no natural barriers except that the Clarks Fork River probably now acts as a barrier. The elk on the north and south sides of the river are not believed to mix a great deal, although this river would in no wise prevent them from crossing should they wish to do so.

There are no pronounced routes of migration similar to those in Yellowstone Park and the Sun River Country. Seemingly, even during the average

winter, elk are driven by deep snow to lower elevations or to south exposures. Elk usually get on the ranches, where they do some damage from March to June, inclusive.

The precipitation records at Thompson Falls do not show snowfall in the adjoining hills, and it is difficult to use these records as a guide. It is safe to say that the range, about 3,000 feet elevation, is usually of no value for winter elk range, and that severe winters are to be expected on an average of about once every third year.

Control.

The past and present size of the herd:

1921—369	1925—298	1929—300
1922—244	1926—328	1930—340
1923—288	1927—300	1931—290
1924—233	1928—290	1932—450

Optimum Size of the Herd.

It is the belief that for the last 10 years the herd has averaged a normal carrying capacity of the winter range. The estimated natural increase is placed at from 5 to 10 per cent. It is recommended that 50 head of elk be removed from this herd each year by issuance of limited licenses to about 60 hunters. Experience has shown that an open season for hunting which allows all of the license holders of the State to hunt elk results in too large a kill of cows and calves.

Damage Done by Elk and Suggested Means of Control.

One rancher reports that the elk damage his hay crop by at least 15 to 20 tons of hay, and that a herd of 27 elk, when chased off the fields with dogs, tore down one-quarter of a mile of fence. Another rancher reports that one year he had a field of oats practically ruined by the elk. It is extremely difficult to find out in dollars and cents just what damage the elk do to the local ranchers, but in the aggregate it averages quite small.

There has been initiated a system of salting in which the State Game Department purchases the salt and the Forest Service distributes it on the range. It was found that by placing the salt well back in the hills away from the ranchers' fields that there was a marked reduction in the amount of damage done. The plans now are to put out the salt in the fall prior to the deep snow, with the belief that by placing salt well back it will aid in holding the elk back. Salt is to be placed out at least twice each year by a co-operative agreement between the State Game Warden and the Forest Service. The State Game Department should, of course, pay for any damage that the elk do to the public or private property, since they derive all of the revenue from the elk.

Conflict With Domestic Stock.

There is but very little definite information on this subject, but on the bulk of the range there is no conflict. There will, no doubt, be a concentration of elk within the proposed Cherry Creek Game Preserve if such a preserve is

created, and if open seasons are made with the steadily decreasing amount of forage due to increasing conifer growth, it would seem perfectly logical to expect that within four or five years no domestic stock will be permitted in this grazing unit. So far there has been no necessity for feeding hay to the elk, and it seems to be inadvisable to start any feeding, for obvious reasons.

Job To Be Done.

The new game preserve, if created, should be adequately posted by members of the State Game Department, local Rod and Gun Club members, and Forest Service men. The Forest Service should see to it that the line is posted according to the description given in the law, which will avoid the trouble caused by incorrect posting such as occurred on the Gallatin and other Forests where the posting was done by men who did not have adequate knowledge of the country.

Summary.

The elk are here. They are a much-prized local asset, and if not allowed to increase beyond the available National Forest winter range capacity **they** should not become a liability as elk herds have become in some other places. Since there is no probability of any other range being dedicated to use as elk range it would seem unwise to consider private lands as available, although use may be made of such lands by game, since no one can foresee if or when serious objection may be made or damage suits may be made.

Recommendations.

1. The continuance of the study to determine the actual location of winter elk range to be set up as a definite job and that adequate time be set up in the work plans to secure the accomplishment.

2. That domestic sheep should be managed insofar as is practical to keep them from the winter game range.

3. That any efforts to increase the size of the herd be opposed until it can be shown that there is ample range available during the most severe winters.

4. That 50 elk be killed each year under the limited license system, 60 per cent of these to be adult bulls and the remainder cows.

COMMENTS ON ELK MANAGEMENT

The three plans published are, I think, typical. They are not chosen as the best, but to illustrate particular points or differences. The Williams Fork plan provides for winter feeding as contrasted with all R-1 plans, where winter feeding is opposed. The idea there, where considerable feeding has been done, seems to be that it won't work on a permanent basis unless you want to raise elk like cattle and depend entirely on feed. It will be interesting to watch the results on the Williams Fork herd. The 47 pounds per head now being fed cannot contribute much to the winter's food supply. According to the R-1 idea, as I get it, we may expect both the amount fed and the winter loss to increase.

The Rio Grande plan is one of the few where feed is not a problem. Here they have withdrawn 23,000 acres from domestic use for winter range. This range would easily support a thousand head of cattle. There is summer range in addition to this. The feed bill of this herd is, therefore, easily a thousand a year, yet they get nothing out of it except the satisfaction of knowing the elk are there. On what basis one waits until the optimum herd is reached before any returns are allowed is not discussed. The stockmen do not do it with their herds and we do not do it in forestry. It seems wasteful to me. Also, I do not understand why, as now used, 2,000 head would have more value than 823.

The estimated loss of 10 per cent seems high as compared to other herds, except where feed is short on the winter range. According to Leopold, the factor or factors causing this loss needs investigation and some manipulation. Since it isn't feed it must be poaching, since predators are not destructive to well-fed elk.

The interesting thing about the Cabinet herd is that the forage results from a fire. Unless they get more fires, the bulk of it will disappear in a few more years. I am wondering about the advisability of building a permanent plan on a temporary basis.

The "crop" recommended for harvest varies in these plans from nothing up to 18 per cent. The 18 per cent is, I think, the highest attempted in any plan. The indications are that on a good range, with some manipulation of sex ratios, it can be maintained, but it takes good management even under favorable conditions. The Cabinet yield is about average. It, also, disregards the heavy loss which is fully equal to the "crop" planned.

The values as discussed seem to confirm the statements by Rush in his report on the Yellowstone herd. The associations want the elk; the stockmen do not. Elk have high recreational value in parks, but most herds are in remote regions during the tourist season. The meat value is high and the sport value low. The common method of hunting is to take pot shots into a herd with a high-power rifle. Having the open season earlier, before the elk begin to bunch up, would prevent this, but at that time the domestic stock are still in the Forests.

The total number of elk reported in 1932 by six Western Regions was 103,749. This number is near the maximum that our Forests can carry on a permanent basis as wild game. Some herds can be increased but others are now

beyond their winter range capacity. Further, as stated for the Cabinet, the range is being gradually reduced by reforestation. There is little feed for elk in coniferous timber.

As a game farming proposition elk can be many, many times increased. They are much like cattle, and can be handled in much the same way. They soon learn to return to the feed lots, and are fed the same as cattle. They should be salted for health and distribution just as cattle are. If they are worth raising, this seems to be the simplest way. This starvation business on the winter range does not appeal to me.

The game "crop" as reported is 7,457. This can, and I presume will, be doubled. That seems to be about the limit. Perhaps through better control of poaching and an adjustment of sex ratios it can be increased slightly beyond that but it doesn't look probable without considerable expense. With the maximum elk production at 15,000 head, and with the annual number of hunters (licensed hunters in the entire United States) numbering 15,000,000—one elk to 1,000 hunters—what is the answer? When hunters in general realize this will they still support elk production? Any one hunter's chance of getting an elk during his lifetime is 1 to 50. Of course, except for local hunters, the chances are not nearly that great. Millions of hunters necessarily never will get an elk. It must be our gambling instinct that supports such an enterprise out of public funds.

And what about the cost? No one gives any weight to forage, yet it usually has a sale value, and only one or two plans provide for the purchase of salt. Administration of the area is also neglected. Rush estimates the cost of an elk at \$142, but if he would add to that the value of the summer forage it would be at least twice that amount. Are they worth it? They are if the people want them, and apparently they do. A question that interests me much more is the relative value. Could we or could we not produce a greater amount of "sport" on the same areas if we went in for some other game animals? How about it?

As I said before, I know nothing about the subject except what I get from reading your reports. What I have said may be all wrong but it represents some of the impressions an outsider gets from reading about it. Recognizing that reading is the only source of information open to most people, possibly my reaction may be of value, and, since I spent three years at a station within one of the areas, I feel I can interpret what is said as well as the average. —P. K.

REVIEW

Northern Yellowstone Elk Study: By W. M. Rush. Published by the Montana Fish and Game Commission.

Since it is presumed that all of you have access to this Bulletin, only the discussion of some of the more important factors needed in management will be touched upon here. Most of this information is, I presume, old stuff to you but it is largely new to me. Still, I never did think much of elk as a game animal, and this report confirms my suspicion. It may have the opposite effect on you.

This report deals with the northern Yellowstone herd—elk that summer mostly in the Park and winter along its north boundary, largely in the National Forests of Montana. It is the result of a three-year study made by a Forest Service man in co-operation with the Park Service and the State of Montana.

The elk, as you know, is a prairie animal originally occupying the plains and open valleys but not going up into the mountains. The advent of the settler drove them back into the hills for food and shelter. There were no elk in the Yellowstone Park in 1870; in 1878 they were common. By 1915 there were 37,000; now there are about 14,000. The limiting factor seems to be a badly overgrazed winter range.

The elk is a grass-eating animal whose forage requirements are very much the same as cattle. They browse to a considerable extent, possibly more than cattle. In general they eat the same plants and relish them in much the same order. The bulletin gives a palatability table based on range observations. Grasses rank much as they do for cattle, but with some of the less palatable ones a bit higher. Browse plants are all higher. For example, aspen leaves are 70, sagebrush 15, and rabbit brush (*chrysanthemums*) 25 on the winter range. The forage requirements of an elk is estimated at two-thirds that of a cow. This gives a good basis for estimating carrying capacity, much better than I have ever seen suggested for deer. Each elk requires a minimum of three pounds of salt each season.

On the winter range everything is eaten, and many of the browse plants are being destroyed. Feeding has been tried to supplement the range but it is not practical. Fed elk soon become dependent and refuse to rustle. The loss is usually greater than where no feeding is practiced. Elk are adapted to poor winter feeding and can endure hardships that would destroy cattle. An elk herd should be held to the carrying capacity of its winter range. Some loss in severe winters is to be expected.

The reproduction of this herd is by actual count 17.4 per cent. The estimated annual kill that can be maintained is 500 head. Nineteen hundred, therefore, are lost from other causes. The greatest loss is during the first winter, when calves are from nine to eleven months old. This is the period when feed is nearly exhausted and calves are unable to get enough to eat. There is considerable loss also among young calves from the bear and coyotes. Poaching, old age and disease account for the rest. Foxtail (*Hordium jubatum*) in the hay

causes some loss. The awns cause sores which admit bacteria.

The calves are born from May 15 to June 10. The breeding season is from September 15 to October 10. The bulls begin to collect their harems from the fifth to the tenth. The average number is six, and the maximum sixteen. There is a great deal of fighting among the bulls, but the fights are tame affairs. The season is over by October 10 and the harems begin to unite into larger groups. Calves are born in the open but are soon taken to shelter, if any is available. About 98 per cent of the females three years and older produce calves. Calving is on the winter range but the spring migration follows immediately.

The recreational value of the elk in the Park is great. Quite a number stay around the open parks near the roads, where they can be seen. Salting helps to hold them. Their sports value, or game value, outside the Park is nil. The killing of the permitted number is not sport, it is the slaughter of meat. But let me give you that in the author's own words:

"The writer has talked with hundreds of these men in the past several years and finds that the greatest majority want meat and want to get it as easily as possible. Not all of this class are in need of meat, either, as many are professional men, merchants, and ranchers who can afford to buy meat. Another smaller class want to shoot an elk for the novelty of it. A still smaller class think they are having real sport, and know no other kind of hunting. Appreciation of the elk as large game animals is totally lacking." "Figuring 500 elk per year, the cost of each elk is \$142.00."

"The limited license system already described in this report would correct this deplorable hunting situation and afford the means whereby the recreational value of the elk would more nearly be approached through sportsmanlike hunting."

SUGGESTIONS FOR DISCUSSION

There are so many questions that seem to need discussion that I fear I may try to crowd too many of them into one lesson. It seems to me that the Senate wild-life committee report is right in that the demands for game are going to increase very materially. How are we going to meet those demands? By game laws and more closed seasons? That would not be meeting them, that would be attempting to squelch them. The demand will be for more hunting—more hunting with something to hunt.

Game studies, while they have not progressed very far for most species, are beginning to give us an idea of what has to be done. Stoddard, for example, has told us in considerable detail just what must be done to produce quail. Quail are particular. They demand certain factors in their range. Meet these factors and quail production responds. Land owners can have any number for which they will provide. Any one of a number of quail experts can tell the owner just what to do, where to do it and the "crop" that his land will produce. While planting quail without providing suitable range is a failure.

Rush has done pretty much the same thing for elk, although his studies seem not quite so far advanced yet as Stoddard's. While the work of these men has been largely confined to the two species, they give us an idea as to what must be done for any species if we want to produce it in abundance. Food supply is everywhere for everything the big problem and, it seems, always has been. And one of the best things these experts have done is to explode the old myth about the abundance of game before the country was settled. Wilderness game was not plentiful because food supplies were limited. The great abundance of game came after the axe and the plow of the settler had opened up the wilderness and increased the feed.

Another of our beliefs that they have corrected is that good game range is a by-product of good forestry. We cannot have our cake and eat it, too. Likewise we cannot grow a maximum forest crop and a maximum game crop on the same area. In many places a decision will soon have to be made as to which crop we want. As the old burns and old cut-over areas restock the game range decreases. This is just one of the facts that must be recognized in planning. The decision, of course, will be made on the basis of crop demand, not on the basis of prejudice or sentiment. Which crop will the people most want?

Another question that intrigues me, and one which I find little discussed, is the question of relative values. Should we produce the game we find wild on the area, should we introduce all the different kinds we can, or should we find the kind that on our particular forest will produce the greatest amount of sport and concentrate our effort on that? For it is not numbers of game but sport that game management seeks to produce. We are catering to man's instinct to kill. Some people object to this and prefer merely to protect wild life. The objection to this view is that nature has ordained that game increase very rapidly. If man does not kill the surplus something else will. There is not room for all.

So to come back to our discussions, what are we going to do about it all, and on what will we base our decisions? But this question is too big for one discussion; it involves too many factors. Some decisions must be made before others, and some have already been made. The following seem to me important:

1. Is it good game management to ask this generation of sportsmen to forego sport entirely in order that the next generation may have a maximum amount?

2. What per cent of the natural increase should be made available to sportsmen before management is considered practicable or successful?

3. What about the relation of costs to results? Or is there any?

4. What about numbers in relation to feed? Are starvation conditions permissible? Should we regulate numbers to the average season and take a heavy loss in severe seasons, or should we hold numbers down to what can live through the bad season?

5. The food supply is, it seems, always important and often the limiting factor. What can be done about it? How can food supplies be increased? What practical methods, if any, are available? (Discuss for any game species you like.)—P. K.

Mr. Rachford has authorized me to say that in his opinion there is no reason for the discussion of game management unless the discussions are reflected in the policies, objectives, and methods of the Service; that he personally will analyze your discussions, summarize them, and adopt the ideas or suggestions on which you fellows in the field are in agreement, or tell you why they cannot be adopted. Suggestions on which the agreement is uncertain will be referred back to you for further discussion. With your co-operation he hopes to make these discussions the basis for a real step in advance in wild-life management. (Further, he would like to see the discussions go to all rangers on important game districts. If you need more copies get them from Haynie, Supply Depot. I will do my best to give you an opportunity to cover every important phase of the subject. And while I comment freely on things myself, remember that my ideas are not authoritative. Yours may not be, either, but if we are to get the most out of this should we not contribute whatever we have?—P. K.)

DISCUSSIONS OF LESSON 21

What a Range Manager Should Know About the Range

Since our November lesson was not published until December, discussions will be late, and so far only a few have been received. These few, however, are good discussions, along the right line, and get down to cases in a way that is helpful. I particularly like the idea, expressed in one of them, that the things a ranger should know should be included in an inspection outline in his work plan. This, I take it, does not mean that jobs would be set up covering what the ranger should learn, but rather that question would be asked in the outline that involved specific information. Without knowledge he could not answer the questions. Of course, this specific knowledge would be only such as is needed and used in range control. For after all the ranger is there to get certain results—to do jobs—not to study botany. He should be asked to learn only what he needs to use.

That what he can use if he has been taught how is considerable, the discussions indicate.

I like the injection into the discussion of the idea that we need and have two types of men: First, the administrators, who must know administration but can depend largely on others for technical information; and second, technical experts, who furnish information and advice on technical matters to the administrator. This system works well when properly correlated, but if the administrator spends too much time in acquiring the technical information, his own specialty, administration, may go to pot, and if the technical man gets out of his field and attempts to give advice on administrative matters the results are as bad or worse. I do not agree exactly with the division that is made as to where the administrator's information may leave off and his dependence on expert advice begin, but it is good enough for a working basis. If used, corrections would soon be made if needed.

It gives me a depressed feeling to read that range management is primarily concerned with cutting down stocking to carrying capacity. After all these years we should be down on at least some areas. And I think we are on most. Of course there will always be pressure for overstocking, and this pressure must be resisted. That is just a part of the job. From my experience I doubt whether one group more than another favors the "elastic carrying capacity."

Just a word about the "mechanical methods" of estimating utilization. I have tried some of the methods which have been proposed, with groups of beginning rangers. I found that even an inexperienced ranger, if he honestly applied the method, would get uniformly good results. The check I used on the quality of their results was the judgment of experienced rangers and supervisors, at least three checks on each ranger group. I know from these tests that a mechanical method can be developed that is practical in application, permits of a reasonably accurate check on the ranger's estimate by an inspector, and that it will give more uniform and more dependable results than methods

now in use. Also, the new method may cost more, that is, take more time.

While I do not want to be critical, it seems to me that some of the discussions miss the point—the administrative desirability of establishing standards definite enough that they can be checked and then requiring that they be met. As stated in one of the papers, not all the needed information has yet been determined. For 3000 years botanists classified plants with little reference to their value; for 30 years botanists have been discovering useful facts about range plants. They have produced a lot, possibly more in the short period than in the longer one. But because they have only gotten well started is no reason why we should not analyze, formulate and use what they now have. To get the greatest use, the experts must put their material into usable form, and translate it from technical language into ordinary work language. This is a part of their job, often the hardest part, and always necessary.

As to the ranger, I've worked with a lot of them. As a class I find them quick to learn, and always anxious to learn anything that is needed or a help on the job. If they do not now know all that they should the fault is not entirely theirs. As practical executives they naturally wait until the experts agree. They have learned to use definite instructions, and definite plans and standards. If this needed range information can be put to them on that basis, I, for one, believe they will not only get it, they will grab it.—P. K.

E. D. SANDVIG

R. J. BOWERS

BEAVERHEAD

DILLON, MONTANA

We are in agreement with Keplinger's three conclusions.

1. Why don't range managers know more about the ranges they are managing?

As we review the reasons, most of them are peculiar to the individual range manager. He has hobbies and caters to these. One man may be absorbed in plant collection, another in the enforcement of regulatory measures for salting, bedding, etc., a third is continuously riding the range, but without specific objective or purpose, perhaps, other than complying with work plan time standards. These men satisfy themselves as to one feature of the range and fail to observe other parts of this complex process of production and sale of forage for the "greatest good to the greatest number in the long run." Again complacency or ignorance with respect to knowledge of the resource accompanies cases where the resource constitutes a minor activity or value.

What can be done to increase the store of knowledge necessary?

Preparation of management plans and inspection reports by the individual we believe to be the most forceful method of all. Preparation of the first plan is usually based on insufficient knowledge to be entirely workable, and of necessity more observations are made until the plan becomes workable. The manager, as a result of gathering the information, acquires an intimate knowledge of the range. This process may take several years, and is not without discouragement, but in the end a thorough knowledge results, along with en-

thusiasm for betterment.

The inspection outline, show-me trips, and study of existing bulletins, publications, and books are all helpful, but with the exception of the inspection do not secure direct enough action. The preparation of a management plan is something creative and allows for consideration of other than purely custodial features which are perhaps overemphasized at present and blind the manager to more insidious attacks that may be in process of wrecking the machinery of his factory.

2. What is the acceptable minimum a range manager should know?

We have attempted to construct a general outline in answer to this question. In preparing this outline we have considered only soil, plant and animal factors as related to the range. That other large factor, the permittee or owner, is not considered in this paper in accordance with Keplinger's suggestion for the discussion.

A. SOIL—Know origin.

General productivity value.

Susceptibility to destructive forces.

B. VEGETATION—Know identification of not less than 25 plant species occurring on the range managed.

Classify into { Beneficial—forage group.
Detrimental—poisonous group.

Know reproduction agencies.

Know growth characteristics.

Know indicators of progressive or retrogressive changes in range.

Know order of preference of stock for edible plants—palatabilities.

C. RANGE ECOLOGY.

1. Recognition of those factors that indicate and forecast range deterioration.

2. Recognition of those factors that forecast or indicate range progression.

D. RANGE USE.

1. Carrying Capacity.

(a) Know closely the forage requirements of an animal expressed in terms of surface acres for a given unit of time.

(b) Know area of range and number of usable acres. This will require an intimate knowledge of the topography, water, and cover.

(c) How to make an empirical survey of forage resources and correlate with "cut-and-try" methods of management. We agree with Hussey that 90 per cent of our range management is based on estimate, but these estimates must be systematic,

if not scientific, in all respects. The term "intelligent guess" is applicable here.

Soil and plants are the principal constituents in the make-up of a range. A range, with all its working parts, is similar to an industrial plant—it produces something. A factory superintendent would not hold his job very long if he failed to inspect his plant and could not recognize those parts that were breaking down or needing repair. An industrial manager sets up a sales organization to sell his product. He makes a study of people as well as his product. The same is necessary for a successful range manager, who, in addition to knowing his product and people, must know livestock, and must on one hand direct the use of his product by livestock and on the other sell the product and his ideas for proper handling of the product to people. In other words, the range manager's knowledge must cover three groups of subjects, which we list in order of importance as follows:

1. People.
2. Range Ecology.
3. Livestock.

3. In providing the required set-up for the acceptable minimum that a range manager should know, we believe this set-up should be made under one general heading: "Range Inspection," in the Rangers' Work Plan. An inspection outline, covering the subjects listed in question two, and in addition the subjects of livestock and human phases of management, would furnish all range managers with a key for the things they are to look for and to report upon. The untrained man would of necessity increase his observation and knowledge and simultaneously be guided in the performance of his job.

A. R. STANDING

REGIONAL OFFICE

OGDEN, UTAH

I was once peering into a microscope when a friend came along and, becoming interested in what I was doing, remarked, "Say, take five minutes off and tell me all about botany." That would have been about as easy as trying to tell all that a Range Manager should know in a page or two. However, a few of the essentials will be briefly discussed.

The range manager must know the important plants. Some are important because of their high palatability. Others may be less palatable but in sufficient abundance to supply considerable forage in the aggregate. Others may not be palatable, but may be poisonous, or indicators of range abuse, or have especial value as soil binders, or for still other reasons be important. It is not essential that these plants be known by their correct scientific or common names, but it is desirable.

The range manager must know the capabilities of the range. This requires a knowledge of soil productivity, of precipitation and other factors that affect plant growth. On some ranges, due to past abuse, the present plant cover is not at all indicative of the range possibilities, and one must delve into past history, or study protected areas, or compare with similar areas that have not

been abused to learn the potentialities of his range, and when a range is depleted one must know the kind of forage crop it is practical to produce before he can (or will) set up proper objectives and initiate management practices that will eventually produce the desired results.

It is important that the range manager knows the key species on the range. These are the half dozen, more or less, species which, because of their high palatability, abundance (or potential abundance), soil-binding qualities, and so forth, should be perpetuated. If these species are not allowed to deteriorate, due to wrong management practices, the manager need not worry about less palatable species, for they will, obviously, be grazed to a less extent, and will get along satisfactorily.

Having decided which are the key species, the range manager must know what constitutes proper use of them. In the case of browse, he must know the amount of current twig growth that should be left unutilized, and in the case of herbaceous plants he must know the amount of leafage that should be left. To graze less than this means a waste of much-needed forage, and to graze more means range depletion.

He must know the revegetation methods of these species so that if, for example, the plant depends on seed production alone to reproduce itself, management practices and stocking can be so regulated that the requirement will be met. Likewise, the needed amount of protection from too early use must be known and provided, but the opening date for grazing must not be unduly postponed to the detriment of the permittee.

The requirements of the plant cannot be determined as a blanket proposition, for the needs of different species vary, and the same species must be handled differently with changing conditions. For example, bluebunch wheatgrass will remain vigorous under much heavier use on the Minidoka Forest than on the Boise, across the Snake River plains, due principally in this case to different soil conditions.

Most ranges cannot be managed on the basis of the livestock alone, so the manager must acquaint himself with the needs and importance of related resources and make adjustments in his range management accordingly. The extent to which game should be allowed to increase and consume forage should be considered. The limits of proper infringement of cows that are not "house-broke" on campgrounds must be decided. The degree of allowable grazing from the stockman's standpoint may not be compatible with a water-user's viewpoint, and so on.

The range man must know what is happening to the range under the management he is applying. Is a good range remaining so without a waste of forage, or is the density decreasing or plant cover changing, and if so, is livestock, weather, or something else the cause? If a change for the worse is taking place what can be done about it? Is a poor range showing proper improvement? If not, what further adjustments are necessary so it will improve? These questions can be answered by close observation and proper interpretation of the

numerous "earmarks" of range deterioration or improvement which the range man must be able to recognize. As an aid to observation there is a place for intelligent use of range plot work of various kinds which he should know how to do.

Another attribute of a good range man hardly comes under the category of what he "should know." It is that intangible something that is probably a species of enthusiasm which makes him very solicitous of the welfare of the range and enables him to detect the first indications that something is wrong; that keeps his eyes glued to the ground seeing what is happening; that keeps him thinking about how to get use of an undergrazed hillside, or relief on a "hard-hit" creek bottom, or better salting done by Jim Jones. And it keeps him everlastingly at his problems until a solution has been found and successfully applied.

C. A. KUTZLEB

REGIONAL OFFICE

DENVER, COLORADO

In a discussion of Mr. Hatton's paper, "What the Range Manager Should Know About the Range," my impression of the subject is that Mr. Keplinger is correct in his first conclusion that a good many range managers do not know their ranges.

As a basis for acquiring a knowledge of a range, I think it is essential that managers know the plants which make up the bulk of the cover. I do not think that it is necessary for a range manager to be a botanist and be able to recognize all the species of plants which occur on his range. In not many cases is it necessary to recognize species, and often it is unnecessary to separate even genera. If a large group of plants having similar forage value occur on similar sites, and react to site conditions in the same way, there is no essential practical value in being able to name each species of the group. Site conditions, types, associations, ecology, utilization determinations and all the other facts which the range manager should know are largely dependent on his ability to recognize the plants. Unfortunately, at the present time, unless a ranger is more or less of a botanist, about the only way he can learn the plants is to ask someone or collect them, and this is a rather slow and uncertain method. I believe it would be a great help if we could forget taxonomy and botany, as such, and get out a publication on forage plants along the line of actual practical needs.

At the same time I do not believe it is too much to expect that range managers acquire a knowledge of the botanical terms which are necessary for concise and accurate description of plants. In other words, utilize botany insofar as it is of practical value and a help to the range manager, but do not go beyond that point merely because it is botany.

Conclusion No. 2 seems to me to be a clear statement of facts. Certainly requirements have never been defined, and there is no question but that they should be. Requirement of this minimum knowledge, however, would seem to depend on making the information which has been accumulated in range man-

agement work readily available. As to No. 3, usability should be the deciding factor. It is neither necessary nor desirable to attempt to develop a force of technical experts for range managers. Limit the requirements to essential practical knowledge and encourage the development of the relationships brought out in Mr. Hatton's paper. The expert or technical man can determine the condition of the range, perhaps, but it requires the intimate knowledge of the local range manager concerning livestock, permittees, and range conditions to secure satisfactory management.

ODELL JULANDER

KAIBAB

KANAB, UTAH

Referring to the two schools of thought on range utilization, the old school or non-technical school of thought which uses broad indicators in judging overuse of range, such as the disappearance of certain palatable species, the replacing of these plants by inferior species and active erosion damage, seem to be considerably slow in recognizing overuse of the range. In cases where such indicators are evident, serious damage by overgrazing has already occurred—possibly to the extent of completely exterminating some species and sometimes causing more or less permanent injury to the range. In such abused ranges the problem is one of restoration as well as maintenance of the important species present. Ranges in such condition are often very slow in regaining their normal producing capacity.

The range manager should be a keen observer, and should be able to recognize overutilization when it occurs so that serious injury by continued overuse could be avoided. In this case none of the above mentioned "earmarks" of serious overgrazing would be evident (provided proper corrective measures were taken), and the range could be kept to its full producing capacity.

It is true that not enough is known about the ability of plants to withstand grazing to set exact standards of utilization for the different types and sites of ranges. However, considerable information has been gained along this line through research and practical experience, and this can be used as an effective guide in determining proper utilization. It will be necessary for the technical man to determine more accurately the withstandability of the important forage plants to grazing. While the cow's appetite and incisors cannot be controlled as a pair of clippers, the clippers in the hands of a range expert may be controlled similar to the cow's incisors and definite information on the reaction of the plant to such treatment obtained. Also the range expert may let the cow itself do the clipping, and by careful measurements gain definite information on the proper degree of utilization of plants.

In addition to knowing the practical administrative phases, the range manager should know and understand plants and be able to judge utilization of plants at least well enough to efficiently apply the information handed him by the research man. With such an understanding of plants he might not only be able to apply the information but also add to it by careful observation and non-technical records.

My discussion will be from the point of view of one in the Service faced with the problem of obtaining proper range use. My experience would indicate that a range manager's ability, as a rule, depends on his knowledge of plants, livestock, and permittees, in the order named.

The first step in range management should be to know the important plants, and especially to know and recognize their response to the various degrees of grazing use. Many forest officers do not see the need for changes in management because they do not recognize or appreciate the stories told by the plants themselves. As an example, Bitter Brush (*Purshia tridentata*) is gradually being killed by too close use on the Plumas, Lassen and Modoc Forests of California. It is a common sight to come upon stands of very old individuals about two-thirds dead, and where there has apparently been no reproduction for over fifteen years. Many rangers will simply look upon this as a natural condition of long standing, and therefore see no need for more conservative use.

The importance of knowing plants, at least in a practical way, holds true for any types. With browse, overgrazing is shown by dead individuals or by dead portions, close-cropped, hedge-like individuals and a lack of reproduction of the more valuable species. Likewise, with weeds and grasses, there is a rather definite change from highly palatable species to those of low value, and, in extreme cases, barrenness and erosion. The point is, that the plants, either by their own physical condition, or by their decrease or increase in numbers, almost invariably point out the condition of the range to one trained to read it.

The second requirement of a range manager should be a knowledge of livestock. This need not be along the lines of breeds and types, but does add interest to the work. It should, however, include an understanding of the habit of grazing animals. Their reaction to various types of forage, to differences in topography, distances to water, location and distance to salt are all factors that must be considered in range management. Without a knowledge of livestock habits, a manager is certainly handicapped when he tries to interpret some of the conditions he observes, and is further handicapped when attempting to foretell the actions of the stock under proposed changes in management.

It is often pointed out that the Range Manager (Ranger) should be familiar with the ranch and range facilities of the permittees outside the Forest. If we exclude the fact that this information is necessary to determine preferences, we would probably find that its real value lies in knowing the permittee rather than the physical conditions of his property. After all, we are dealing with the owners or stock managers, and their co-operation is necessary for successful application of plans. The Ranger who knows his grazing permittees is therefore prepared to deal with each man in the manner suggested by his character and disposition.

There are, of course, many other things that the range manager should know. However, a combination of practical knowledge of livestock habits and

scientific knowledge of plants should be an excellent and ample foundation from which to start. How to acquire this is, of course, another subject.

T. LOMMASSON

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From the standpoint of the range manager, his range is his stock in trade. Upon its character depends the use to which it can be put and the amount of use which can be obtained from it. The crop is a perennial one, and is dependent for its quality and volume on various factors, most of which are controllable, providing the necessary knowledge is obtainable upon which to base the needed action.

In order to be in a position to take effective action to meet any condition which may obtain, a recognition and knowledge of the changes to which a forage crop is subject is essential. This necessary information may come from any source as long as it is authentic and dependable. The source may be practical or technical, it matters little so long as it is fact and can be used in practice. A thorough workable knowledge of the range, its crop and condition provides the foundation for constructive management. At present some of this is known and some has yet to be worked out. When knowledge or method is lacking it is necessary to follow the best judgment under the conditions prevailing. The best natural conditions may not represent the maximum in production obtainable from a range. If the crop can be increased by other than natural methods the manager should be in a position to recognize this. He should know the limitations which govern the forage crop and develop his objectives in accordance with these.

Administrative objectives and limitations are laid down for use in practical administration. A thorough knowledge of these is necessary in order to co-ordinate the use of the range in a manner which will assist in carrying out the objectives he has determined for the range.

Following these the manager must work with the men using the range for the purpose of attaining those points which his analysis of the range indicates as necessary to its maintenance or improvement.

Nobody has a corner on knowledge. It is produced by many in many places. To fill the need it must be drawn from wherever it may be. But let it be as near to fact as is obtainable. Then fit it to the conditions involved and act accordingly.

My guess would be that the order of importance of points for a range manager would be as follows: Know the range and how to meet its needs. Know the administrative machinery and objectives by which the range is governed. Know how to manage the users and their stock. Know how to co-ordinate these in order to meet the needs of the range and the stockmen.

EDWARD P. CLIFF

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From a study of the discussions already presented on this subject we find

that the successful range manager must be a rather versatile sort of person. He must have a certain amount of knowledge of the technical phases of range management, and with it he must have a large share of good, sound, practical knowledge and good common sense.

There is no doubt in my mind as to the necessity and importance of an intimate knowledge of the range, plant cover, the soil and practical working knowledge of the factors which affect these things. It is, likewise, essential that the range manager have a knowledge of the objectives of range management, and he must know the regulations under which he must work.

I was much interested in Mr. Hatton's statement, in his article in the December 5, 1933, issue of Executive and Personnel Management, "that the range manager should secure a live interest in the livestock and range management subject in its various phases and relations." Mr. Hatton went on to explain that first-hand contact and knowledge of the stockmen's problem is a desirable thing. It is my opinion that Mr. Hatton has here struck one of the keynotes of successful range management.

It is believed that we can learn a great deal about range management from the livestock grower, and can accomplish a great deal in the applying of principles of range management by gaining his confidence and by cultivating his friendship.

The district ranger, in order to successfully manage the forage resources on his district, should be intimately acquainted with the range livestock industry. The stockman is in the business to make a profit. He must be able to produce fat lambs and fat steers economically or his business will not survive. The range manager must have an appreciation of the stockman's problems and be prepared to manage the range in a manner which will not work undue hardships on the permittee, but which will allow him the greatest possible profit and at the same time fulfill the objectives of range management.

We must remember that the man who rides the range and tends the flocks and herds on our ranges is the man who can make our management a success or cause it to be a failure. The full co-operation and friendship of the man who really works out all of our plans is essential if the range is to be managed properly. This co-operation and friendship is worth striving for, and can usually be obtained by the range manager who has a knowledge and a sympathetic understanding of the problems confronted by the livestock industry.

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1. Rather than confine this statement to rangers, I would make it all inclusive, although the ranger, due to his more immediate and frequent contact with the range units, is the more important member of the personnel to have definite knowledge. To my mind, the important thing is to know what is happening to the *forage resources*. The practical handling of livestock has its place in the scheme of range management, but if we are to maintain or improve our forage resources, we must know *definitely* what the various influences are

that affect the plant life, upon the utilization of which our success in range management depends. This we do not *definitely* know, and we will not know until the results of research are made available to us in a more simple and understandable way than has been the practice heretofore.

2. After a quarter of a century of range management there is altogether too great a school that still believes that a practical knowledge of handling stock is of primary importance in range management. Above all, we should know what is happening to the soil, for upon the soil depends the crop that we sell. Region Five, in Part 2 of their handbook on Personnel Management and Procedure, under training, gives the most practical outline of what a range manager should know that has come to my attention. Emphasis is placed on soil, with many simple hints as to how to recognize overgrazing through the observance of what is happening to the soil. Heretofore we have based our judgment too much upon the degree of utilization, plant indexes, etc. We perhaps have been following a blind trail. With the start made by Region Five, cannot we have an outline on training that will educate our personnel in the fundamentals of range management, as it applies to the soil and forage resources? And may I ask why should we particularly attempt to expert ourselves in ranch and livestock management, as suggested by Hatton, other than to be able to recognize the principles of handling stock; to be able to converse intelligently or as a measure of public relations, which Major Kelley would term the human relations of range management? Why should we urge conservatism in forage utilization as a standard, if by intelligent range management, based upon known facts, we can make our ranges contribute more to the stock industry than by locking up the forage resource through conservative utilization, because we can do this without having to apply knowledge to the resource? Our utilization should be just as complete as is possible without injury to soil or plant life. Understocking will accomplish this at the expense of wasting the resource. Range management will do this if we have the knowledge of how to apply it as it affects the soil and plant life upon which our forage resource depends.

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Whether the range manager needs merely "ordinary common sense and experience in the particular locality under consideration," as Hussey vigorously asserts, or should be a "specialist with a minimum of five years' experience on the supervisor's staff," as Robinson insists, depends upon the nature of the job which the range manager is expected to accomplish. Keplinger has very definitely listed three aspects of the range management activity, *i. e.*, (1) management of the forage resource, (2) handling of the grazing animals, and (3) dealing with permittees. Recognizing the confusion that would result from attempting to discuss all three phases of the job at one sitting he very judiciously limited comments in this lesson to the management of the forage resource. Incidentally, a failure to recognize or at least to provide for the requirements of plants in an effort to appease the present demands of the permittees or to meet the convenience of handling livestock is undoubtedly at the seat of most

range management difficulties. The specialist who proposes a plan of management which adequately meets the vegetative requirements is apt to be called impractical if the plan provides for unpopular changes in the going methods of handling stock, or works economic hardship upon permittees. *Some* so-called *practical* range administrators would like to have management plans with elastic carrying capacities so that, for example, a range which carries 100 head of stock if the permittees approve, would carry 200 head if the permittees were troublesome and inclined to appeal, or failed to sell their increase, or wanted a larger permit because their hay crop failed, etc., etc. In reality a plan does not justify the name unless it sets forth definitely the steps which must be taken to properly administer the forage resource, regardless of the extent to which it may interfere with present practices of handling stock. This doesn't mean, of course, that a difficult or expensive method of use should be set up in the plan where a more simple method would meet the plant requirements; quite the contrary. The point we are stressing is the simple proposition that range managers must first of all determine the needs of the forage resource, including soil, then it is an entirely separate proposition to adjust the handling of stock in accordance with plant and soil requirements. Accordingly, Kep's proposal to discuss management of the forage resource separately from other aspects of the range manager's job should be followed if in this series of lessons we are to avoid confusion, duplication and too much loose thinking. He did not indicate in what type of Forest organization the ranger is whose job we are discussing, *i. e.*, a set-up in which the ranger is expert in all phases of the various activities or one in which the ranger is essentially an administrator and has access to expert advice. For the purpose of this discussion I am assuming the latter type of organization—partly because that is, in my judgment, the desirable form of organization and partly because that is essentially setting forth the information about plants and forage management which a ranger personally should possess it is not proposed to include information more technical in character which the ranger would need only for reference and which would be furnished upon request by the specialist. In the latter category would be the studies undertaken to determine proper utilization, the forage value of the more or less skeleton form we have at the present time. Therefore, in set-plants, the optimum stand of vegetation a particular site is capable of producing, the relation of vegetation to erosion control, the best technique to use in sample-plot work, etc. The information which, under the present set-up, each ranger should possess about the forage resource in order to administer it intelligently and effectively may be outlined as follows:

1. The occurrence of the principal species making up the vegetation, their forage and economic value, how the present species compare in density and composition with what each type is capable of supporting.
2. The general character of each principal soil type, its productivity, its condition with reference to erosion and the character and amount of vegetative cover necessary to prevent accelerated erosion and heal erosion scars.
3. The problems connected with forage management, such as:

The variation in use due to difference in palatability, distance from water, topography, elevation, etc.

Condition of the forage and soil due to past management.

Deficiency in new plants to replace those which for any reason disappear and the obstacles in the way of adequate reproduction.

Limitations in usability due to occurrence of poisonous plants.

4. The specific objectives with reference to the management of forage based upon the problems in each allotment and the character and amount and period of use that may be allowed in attaining the objectives.
5. The degree to which actual use compares specifically with the use provided for in the management plan.
6. The actual effect of the current use upon attainment of specific objectives (necessity for sample plots).

It will be seen that the class of information outlined is not technical in the sense that it would require an advanced student of botany to secure it; the average of the better type of rangers now in the Service could readily obtain it for his district after a little coaching, and with the proper incentive would make practical use of it in keeping the management of the range abreast of changing needs. By all means I would depend upon the upstanding ranger as at present constituted to continue as range manager. But his technical knowledge should be supplemented and he needs coaching if he is to be an efficient up-to-date manager. To get all the technical information himself would require a lot of time-consuming work which every ranger would needlessly duplicate. Proper correlation of standards and efficient use of time require that we have a limited number of technically trained advisors with practical experience.

It is fully appreciated that the range manager must possess practical knowledge about the handling of livestock and game under the conditions prevailing locally; he must also have the executive's ability to secure the full participation of stockmen in accomplishing successful administration of the **range**. As previously stated, Kep has not included these phases of range management in the list of subjects for discussion in this lesson.

The criticism that "we are looking for a problem in calculus when it is only a matter of grade school arithmetic" cannot be dismissed lightly. I am convinced that most of our range management problems *are* problems because we have failed to recognize the simple fact that refined and involved methods of handling will not overcome the basic difficulty of trying to carry too many cattle or sheep on a given unit. One of the most important things for a ranger to know is the practical limitation beyond which it is hopeless to attempt, by salting or riding or by deferred grazing, to get use of bunchgrass slopes adjacent to meadows without injuring the meadows; the impossibility of maintaining palatable species of plants if there are inadequate replacements; the futility of attempting to correct general overgrazing by changing the order in which different units are grazed, etc. If the critic will go farther and state that,

above all, the range manager must be able to recognize and analyze the *real* difficulties in the way of getting the sort of use that is needed and then work out the simplest, most direct remedy, we will be for him 100 per cent.

In reading Mr. Hatton's article I was interested in comparing the platform of the "New School" of range managers with that of the "Older School." The only plank in the platform of the "New School," according to Hatton, is "more or less mechanical measures to determine proper utilization." All of the principal virtues appear to have been pre-empted by the "Older School." But I believe the point of view of the so-called "New School" deserves some elaboration. If I understand correctly, the "mechanical measures to determine proper utilization" refer to the proposal to define proper utilization, not in blanket terms, such as "leaving from 10 to 25 per cent of palatable vegetation," as set forth in the Manual—a definition that is subject to all sorts of interpretation, and therefore is of little value as a guide to the range manager or permittee—but in definite descriptive terms subject to only one interpretation. A group of grazing men out on the range can readily agree on the selection of a sample plot which represents the consensus of opinion as to proper utilization under the particular set of conditions prevailing there. A photograph might be taken showing the exact extent to which the principal plants in the sample plot are grazed, and the same impression would be gained by everyone upon seeing the photograph. Now, instead of actually taking a photograph, it would be a comparatively simple matter to describe the extent to which the "key" plants were grazed so as to give just the same impression that is gained from looking at the plot or at the photograph. Then instead of saying 25 per cent of the palatable vegetation should be left, we would say that, in the ordinary year, an average of three inches of foliage should be left on the wheat grass and that twenty seed-stalks should be left to mature on a square yard of surface. A comparable description could be prepared for, perhaps, five key plants in each type.

Problems of utilization are not necessarily uniform over allotments or over forage types. Utilization standards must recognize the variations that occur and allow for them. If a browse slope, for instance, can be used under the best practical management only slightly it is not helpful to read in the management plan that 75 per cent of the palatable forage on the allotment as a unit should be utilized. If, on the other hand, the plan describes definitely in just what condition each important part of the allotment should be left at the end of the season it provides a standard by which range manager, permittee and inspector alike may be safely guided. When such a set-up is supplemented by an actual use map corrected each year to show the extent to which the management plan is being applied, and what further adjustments should be made, a record is available of immeasurable value in management.

Some skepticism is expressed regarding the ability of forest officers to determine just how much of plants of different species should be grazed under various management conditions. The answer to this is that we do, or should do, that very thing every time we make a range inspection. We compare the actual use with the conception in our individual minds of what proper utilization is.

The difference is—and it is the weakness of the present system—the mental standard is subject to a different interpretation by everyone concerned. Consequently we have practically no standards of utilization applicable to the sore spots on the range, where, after all, our real problems of management occur.

It is all very well to say that this refinement could be avoided if we would simply reduce the number of stock to the point where abundant vegetation would be left on all parts of each allotment. But nearly every supervisor realizes from bitter experience how difficult it would be to reduce the numbers of stock on an allotment to the point where the sore spots would be able to heal without special provision for their protection. Most everyone would favor restricting stocking to a conservative basis, but so long as a keen demand for range continues we will not be able—and it should not be our aim—to reduce stocking to the point where proper utilization would no longer be an important problem.

There is another plank in the platform of the “New School” which deserves mention and it is simply this—an insistence upon a sample plot program which will furnish an indisputable answer to many controversial questions regarding the range, such as:

1. What density and composition of vegetation is a particular range unit capable of supporting?
2. Is the forage improving or slipping and at what rate?
3. Are undesirable plants gaining ground and at what rate?
4. What character and density of vegetation is essential on different exposures, in different forage types, under different soil formations to protect against and heal erosion?
5. What effect does drought have upon the composition and density of vegetation?

The reason for advocating such a program is the deplorable fact that after twenty-five years of administration we are still depending upon memory and individual judgment to guide us in directing the management of forest ranges. Whenever two or more officers, particularly if they are from different forests, make a joint range inspection there is bound to be more or less serious differences of opinion regarding these and similar questions. As long as we must depend upon opinion there is no way of deciding the questions, and yet the very life of the range resource and the permanent value of the watershed depend upon management being based upon correct answers to these questions. The only dependable means yet proposed of answering these questions is by keeping accurate records of adequate sample plots. For immediate needs sample plots could be selected which would show the accumulated changes that have resulted from drought and from different intensities and methods of grazing. They would be reasonably authoritative indicators of any adjustments that are required immediately. But along with them should be developed a system of sample plots which would answer troublesome questions regarding the future effects of any adjustments that may be made and what further adjustments are needed. To some of us it may appear that the additional work involved in

carrying out such a proposal could not be handled by the present personnel. That is a debatable question. But the advisability of undertaking an adequate **sample-plot program** cannot be determined by the capacity of the present personnel any more than the question of adequate fire protection, erosion control, game management, etc., can be disposed of in that manner. We must assume that the character of our organization is subject to at least minor changes if the needs for such changes are clearly demonstrated. Admittedly rangers should not be expected to handle a large series of quadrats requiring detailed charting; that is a job for specialists. Sample plots in the sense that the term is used here include list plots, species plots, temporary comparison plots, observation stations—all of which can be handled effectively by rangers. The information obtained from them constitutes essential knowledge that a range manager should have in order to determine *what is happening to the range*—the only reliable test of the success or failure of actual management.

